

## CLAIMS

What is claimed is:

1. A 5-layer co-extruded biaxial-oriented polypropylene synthetic paper with 5-layer laminated structure comprising the uppermost layer (A) of paper sheet or resin, the second layer (B) of paper sheet or resin, the intermediate foamed layer (C), the forth layer (D) of paper sheet or resin and the bottom layer (E) of paper sheet or resin which are laminated to form a synthetic paper with thickness between 30~300 $\mu$ m, wherein the composition of the uppermost layer (A) of paper sheet or resin and the bottom layer (E) of paper sheet or resin both include polypropylene 96~36% by weight, polyethylene 0~30% by weight, antiblocking agent 2~5% by weight, titanium dioxide master batch (30~60%) 0~15% by weight, calcium carbonate master batch (40~70%) 0~15% by weight, ultraviolet ray absorbent 1~2% by weight and anti-oxidation agent 1~2% by weight;  
the composition of the second layer (B) of paper sheet or resin and the forth layer (D) of paper sheet or resin both include polypropylene 97~54% by weight, polyethylene 0~15% by weight, titanium dioxide master batch (30~60%) 0~15% by weight, calcium carbonate master batch (40~70%) 0~15% by weight, antistatic agent 1~7% by weight, ultraviolet ray absorbent 1~2% by weight, and anti-oxidation agent 1~2% by weight; and  
the composition of the intermediate foamed layer (C) includes polypropylene 88~46% by weight, polyethylene 0~15% by weight, calcium carbonate master batch (40~70%) 5~15% by weight, titanium dioxide (30~60%) 5~15% by weight, ultraviolet ray absorbent 1~2% by and anti-oxidation agent 1~2% by weight.
2. The 5-layer co-extruded biaxial-oriented polypropylene synthetic paper according to claim 1 wherein the thickness of the synthetic paper is 170 $\mu$ m, and the 5-layer laminated structure of the said synthetic paper comprises:  
the uppermost layer (A) of paper sheet of which the composition includes polypropylene (MFI:6) 48% by weight, polyethylene (MFI:0.05) 30% by weight, titanium dioxide master batch (40%) 15% by weight, calcium carbonate master batch (60%) 15% by weight, antiblocking agent 2% by weight, ultraviolet ray absorbent 1% by weight and anti-oxidation agent 1% by weight;  
the second layer (B) of paper sheet of which the composition includes polypropylene (MFI:3) 71%, calcium carbonate master batch (60%) 15% by weight, titanium dioxide master batch (40%) 15% by weight, antistatic agent 7% by weight, anti-oxidation agent 1% by weight and ultraviolet ray absorbent 1% by weight;  
the third layer (C) of foamed layer of which the composition includes

polypropylene (MFI:2.4) 78% by weight, calcium carbonate master batch (60%) 15% by weight, titanium dioxide filler master batch (40%) 5% by weight, anti-oxidation 1% by weight and ultraviolet ray absorbent 1% by weight;

the forth layer (D) of paper sheet of which the composition includes polypropylene (MFI:3) 71% by weight, calcium carbonate master batch (60%) 15% by weight, titanium dioxide master batch 15% by weight, antistatic agent 7% by weight, anti-oxidation agent 1% by weight and ultraviolet ray absorbent 1% by weight; and

the fifth layer (E) of paper sheet of which the composition includes polypropylene (MFI:6) 95% by weight, antiblocking agent 3% by weight, anti-oxidation agent 1% by weight and ultraviolet ray absorbent 1% by weight.

3. The 5-layer co-extruded biaxial-oriented polypropylene synthetic paper according to claim 1, wherein the thickness of the said synthetic paper is 90 $\mu$ m, and the 5-layer laminated structure of the synthetic paper comprises:

the uppermost layer (A) of paper sheet and the bottom layer (E) of paper sheet of which the composition includes polypropylene (MFI:6) 94% by weight, anti-oxidation agent 2% by weight, antiblocking agent 2% by weight and ultraviolet ray absorbent 2% by weight;

the second layer (B) of paper sheet and the forth layer (D) of paper sheet of which the composition includes polypropylene (MFI:6) 93% by weight, antistatic agent 5% by weight, anti-oxidation agent 1%, ultraviolet ray absorbent 1% ; and

the third layer (C) of foamed layer of which the composition includes polypropylene (MFI:3) 68% by weight, calcium carbonate master batch (60%) 15% by weight, titanium dioxide master batch (40%) 15% by weight, anti-oxidation agent 1 % by weight and ultraviolet ray agent 1% by weight.

4. A production process for producing the 5-layer co-extruded biaxial-oriented polypropylene synthetic paper with thickness between 30~300 $\mu$ m whereby the 5-layer laminated structure is produced by employing a 5-layer co-extruded biaxial-oriented production process which comprises the following steps:

- (a) the uppermost layer (A) of paper sheet or resin and the bottom layer (E) of paper sheet or resin are extruded separately by two hopper venting type single-screw secondary extruders under temperature between 160~280 $^{\circ}$ C by having the mixture containing polypropylene 96~36% by weight, polyethylene 0~30% by weight, antiblocking agent 2~5%, titanium dioxide master batch (30~60%) 0~15% by weight, calcium carbonate master batch (40~70%) 0~15% by weight, ultraviolet ray absorbent 1~2% by weight, anti-oxidation agent 1~2% by weight, uniformly blended at first in the feeding hopper in front of the single-screw secondary extruders, and then the

well blended mixture is fed into the single-screw secondary extruders for fine blending and air venting; then the well blended and air vented mixture is pressed separately into the first layer runner and the fifth layer runner of the T-die;

- (b) the second layer (B) of paper sheet or resin and the forth layer (D) of paper sheet or resin are extruded separately by two hopper venting type single-screw secondary extruders under temperature between 160~280°C by having the mixture containing polypropylene 97~54% by weight, polyethylene 0~15% by weight, titanium dioxide master batch (30~60%) 0~15% by weight, calcium carbonate master batch (40~70%) 0~15% by weight, antistatic agent 1~7% by weight, ultraviolet ray absorbent 1~2% by weight, anti-oxidation agent 1~2% by weight uniformly blended at first in the feeding hopper in front of the single-screw secondary extruders, and then the well blended mixture is fed into the single-screw secondary extruders for fine blending and air venting, then the well blended and air vented mixture is pressed into the second layer runner and the forth layer runner of the same T-die as mentioned above;
- (c) the third layer (C) of the foamed layer is extruded by a twin-screw primary extruder equipped with venting device under temperature between 160~280°C by having the mixture containing polypropylene 88~46% by weight polyethylene 0~15% by weight, calcium carbonate master batch (40~70%) 5~20% by weight, titanium dioxide master batch (30~60%) 5~20% by weight, ultraviolet ray absorbent 1~2% by weight and anti-oxidation agent 1~2% by weight uniformly blended in the feeding hopper in front of the twin-screw primary extruder for fine blending and air venting, and then the well blended an air vented mixture is pressed into the third layer runner of the same T-die;
- (d) the 5-layer laminated structure obtained from the co-extruding process by the T-die as described above then passes the cooling and forming equipment to form 5-layer laminated sheet under temperature range of 15~17°C;
- (e) the 5-layer laminated sheet obtained from step (d) is then introduced into the longitudinal orientation device for longitudinal drawing under temperature range of 155~150°C for a longitudinal enlargement of 2.5~7 times the original length;
- (f) the 5-layer laminated sheet obtained from step (e) is then introduced into the lateral orientation device for lateral drawing under temperature range of 140~200°C for a lateral enlargement of 5~15 times the original width;
- (g) then the 5-layer laminated sheet obtained from step (f) in which the

longitudinal and lateral orientation of the laminated sheet are completed is treated by corona treatment equipment; and

(h) the finished product of 5-layer co-extruded biaxial-oriented polypropylene synthetic paper with thickness between 30~300 $\mu$ m is wound into roll by winding machine.

5. The process for producing 5-layer co-extruded biaxial-oriented polypropylene synthetic paper according to claim 4, wherein the additives of inorganic powder for preparing the master batch is selected from the group of calcium carbonate including heavy or light weight, titanium dioxide including A-type or R-type, diatomaceous earth, clay, calcium oxide, silicon dioxide and barium sulfate which pass the surface treatment process, and then is blended to form master batch with particle size between 0.05 ~15 $\mu$ m.
6. The process for producing the 5-layer co-extruded biaxial-oriented polypropylene synthetic paper according to claim 4, wherein a twin-screw extruder is employed, and one or more than one kind of the mixture of additives and inorganic powder is directly added into the extruder from the side feeding hopper instate of pre-making the master batch with different additives and inorganic powder.